

1. An infiltrant system comprising:
a resin component comprising:
an epoxy resin; and
a diluent; and
5 a hardener component comprising:
an amine selected from unmodified aliphatic amines, modified
aliphatic amines, unmodified cycloaliphatic amines, modified
cycloaliphatic amines, unmodified amidoamines, modified
amidoamines, or combinations thereof;
10 optionally an amide selected from modified amidoamines, unmodified
amidoamines, polyamines, or combinations thereof; and
optionally a catalyst.
2. The infiltrant system of claim 1 wherein the epoxy resin is selected from
15 bisphenol A, bisphenol F, or combinations thereof.
3. The infiltrant system of claim 1 wherein the diluent is selected from reactive
diluent, nonreactive diluent, or combinations thereof.
- 20 4. The infiltrant system of claim 3 wherein the diluent is a reactive diluent
selected from difunctional reactive diluent, monofunctional reactive diluent, or
combinations thereof.
5. The infiltrant system of claim 4 wherein the reactive diluent is selected from
25 diglycidyl ether, glycidyl ether, or combinations thereof.
6. The infiltrant system of claim 5 wherein the diglycidyl ether is neopentyl
glycol diglycidyl ether.
- 30 7. The infiltrant system of claim 1 wherein the amine is an unmodified aliphatic
amine.

8. The infiltrant system of claim 7 the unmodified aliphatic amine is aminoethyl-piperazine.

9. The infiltrant system of claim 7 wherein the amine is a polyamine.

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10. The infiltrant system of claim 9 wherein the polyamine is a polyoxypropyleneamine base polyamine.

11. The infiltrant system of claim 7 wherein the unmodified aliphatic amine is a diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine.

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12. The infiltrant system of claim 7 wherein the amine is a mixture of a polyoxypropyleneamine base polyamine and a diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine.

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13. The infiltrant system of claim 1 wherein the amide is selected from modified amidoamines, or unmodified amidoamines.

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14. The infiltrant system of claim 13 wherein the amide is an unmodified amide/imidazoline.

15. The infiltrant system of claim 1 wherein the amide is a mixture of polyamides.

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16. The infiltrant system of claim 1 wherein the catalyst is selected from tertiary amines or benzyl alcohol.

17. An infiltrant system comprising:

a resin component comprising:

about 50 to about 90 % by weight of resin component of an epoxy resin; and

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about 10 to about 50 % by weight of resin component of a diluent; and a hardener component comprising:

about 20 to about 80 % by weight of hardener component of an amine selected from unmodified aliphatic amines, modified aliphatic amines, unmodified cycloaliphatic amines, modified cycloaliphatic amines, unmodified amidoamines, modified amidoamines, or combinations thereof;

about 20 to about 70 % by weight of hardener component of an amide selected from unmodified amidoamines, modified amidoamines, or combinations thereof; and

0 to about 10 % by weight of hardener component of a catalyst.

18. The infiltrant system of claim 17 wherein the epoxy resin is selected from bisphenol A, bisphenol F, or combinations thereof.

19. The infiltrant system of claim 17 wherein the epoxy resin is present in an amount of about 70 to about 85 % by weight of resin component.

20. The infiltrant system of claim 17 wherein the diluent is present in an amount of about 15 to about 30% by weight of resin component.

21. The infiltrant system of claim 17 wherein the diluent is selected from reactive diluents, nonreactive diluents, or combinations.

22. The infiltrant system of claim 21 wherein the diluent is a reactive diluent selected from difunctional reactive diluents, monofunctional reactive diluents, or combinations thereof.

23. The infiltrant system of claim 22 wherein the reactive diluent is selected from diglycidyl ether, glycidyl ether, or combinations thereof.

24. The infiltrant system of claim 23 wherein the reactive diluent comprises a mixture of about 5 to about 30 % by weight of resin component diglycidyl ether and about 5 to about 20 % by weight of resin component glycidyl ether.

25. The infiltrant system of claim 24 wherein the reactive diluent comprises a mixture of about 10 to about 20 % by weight of resin component diglycidyl ether and about 5 to about 10 % by weight of resin component glycidyl ether.

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26. The infiltrant system of claim 23 wherein the diglycidyl ether is neopentyl glycol diglycidyl ether.

27. The infiltrant system of claim 17 wherein the amine is an unmodified aliphatic amine.

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28. The infiltrant system of claim 27 the unmodified aliphatic amine is aminoethyl-piperazine.

29. The infiltrant system of claim 17 wherein the amine is present in an amount of about 30 to about 60 % by weight of hardener component.

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30. The infiltrant system of claim 17 wherein the amide is a modified amide/imidazoline.

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31. The infiltrant system of claim 17 wherein the amide is present in an amount of about 40 to about 60 % by weight of hardener component.

32. The infiltrant system of claim 17 wherein the catalyst is selected from tertiary amines or benzyl alcohol.

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33. The infiltrant system of claim 17 wherein the catalyst is present in an amount of about 3 to about 7 % by weight of hardener component.

34. The infiltrant system of claim 17 wherein the resin component comprises:

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about 50 to about 90 % by weight of resin component of the epoxy resin selected from bisphenol A, bisphenol F, or combinations thereof; and

5 about 10 to about 50 % by weight of resin component of a reactive diluent selected from diglycidyl ether, glycidyl ether, or combinations thereof; and

the hardener component comprises:

about 20 to about 80 % by weight of hardener component of an unmodified aliphatic amine;

10 about 20 to about 70 % by weight of hardener component of a modified amidoamine, an unmodified amidoamine, or combinations thereof; and

0 to about 10 % by weight of hardener component of a tertiary amine catalyst.

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35. The infiltrant system of claim 34 wherein

the resin component comprises:

about 70 to about 85 % by weight of resin component of bisphenol F; and

20 about 10 to about 20 % by weight of resin component of the reactive diluent diglycidyl ether;

about 5 to about 10 % by weight of resin component of the reactive diluent glycidyl ether; and

the hardener component comprises:

25 about 30 to about 60 % by weight of hardener component of aminoethyl-piperazine;

about 40 to about 60 % by weight of hardener component of a modified amide/imidazoline; and

30 3 to about 7 % by weight of hardener component of the tertiary amine catalyst.

36. An infiltrant system comprising:

a resin component comprising:

about 50 to about 90 % by weight of resin component of an epoxy resin; and

about 10 to about 50 % by weight of resin component of a diluent; and

5 a hardener component comprising:

about 30 to about 90 % by weight of hardener component of an amine selected from unmodified aliphatic amines, modified aliphatic amines, unmodified cycloaliphatic amines, modified cycloaliphatic amines, unmodified amidoamines, modified amidoamines, or combinations

10 thereof; and

about 10 to about 40 % by weight of hardener component of an amide selected from polyamides and mixtures thereof.

37. The infiltrant system of claim 36 wherein the epoxy resin is selected from
15 bisphenol A, bisphenol F, or combinations thereof.

38. The infiltrant system of claim 36 wherein the epoxy resin is present in an amount of about 70 to about 85 % by weight of resin component.

20 39. The infiltrant system of claim 36 wherein the diluent is present in an amount of about 15 to about 30% by weight of resin component.

40. The infiltrant system of claim 36 wherein the diluent is selected from reactive diluents, nonreactive diluents, or combinations thereof.

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41. The infiltrant system of claim 40 wherein the diluent is a reactive diluent selected from difunctional reactive diluents, monofunctional reactive diluents, or combinations thereof.

30 42. The infiltrant system of claim 41 wherein the reactive diluent is selected from diglycidyl ether, glycidyl ether, or combinations thereof.

43. The infiltrant system of claim 42 wherein the reactive diluent comprises a mixture of about 5 to about 30 % by weight of resin component diglycidyl ether and about 5 to about 20 % by weight of resin component glycidyl ether.

5 44. The infiltrant system of claim 43 wherein the reactive diluent comprises a mixture of about 10 to about 20 % by weight of resin component diglycidyl ether and about 5 to about 10 % by weight of resin component glycidyl ether.

10 45. The infiltrant system of claim 42 wherein the diglycidyl ether is neopentyl glycol diglycidyl ether.

46. The infiltrant system of claim 36 wherein the amine is a mixture of a polyamine and an unmodified aliphatic amine.

15 47. The infiltrant system of claim 46 wherein the amine is a mixture of about 20 to about 80 % by weight of hardener component of the polyamine and about 10 to about 40 % by weight of hardener component of the unmodified aliphatic amine.

20 48. The infiltrant system of claim 47 wherein the amine is a mixture of about 35 to about 60 % by weight of hardener component of the polyamine and about 20 to about 30 % by weight of hardener component of the unmodified aliphatic amine.

49. The infiltrant system of claim 46 wherein the polyamine is a polyoxypropyleneamine base polyamine.

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50. The infiltrant system of claim 46 wherein the unmodified aliphatic amine is a diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine.

30 51. The infiltrant system of claim 46 wherein the amine is a mixture of a polyoxypropyleneamine base polyamine and a diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine.

52. The infiltrant system of claim 36 wherein the amide is present in an amount of about 20 to about 35 % by weight of hardener component.

53. The infiltrant system of claim 36 wherein

5 the resin component comprises:

about 50 to about 90 % by weight of resin component of an epoxy resin selected from bisphenol A, bisphenol F, or combinations thereof; and

10 about 10 to about 50 % by weight of resin component of a reactive diluent selected from diglycidyl ether, glycidyl ether, or combinations thereof; and

a hardener component comprising:

15 about 20 to about 80 % by weight of hardener component of a polyamine; about 10 to about 40 % by weight of hardener component of an unmodified aliphatic amine; and
about 10 to about 40 % by weight of hardener component of a mixture of polyamides.

54. The infiltrant system of claim 53 wherein

20 the resin component comprises:

about 70 to about 85 % by weight of resin component of bisphenol F; and

about 10 to about 20 % by weight of resin component of the reactive diluent diglycidyl ether;

25 about 5 to about 10 % by weight of resin component of the reactive diluent glycidyl ether; and

a hardener component comprising:

about 35 to about 60 % by weight of hardener component of a polyoxypropyleneamine base polyamine;

30 about 20 to about 30 % by weight of hardener component of an diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine; and

about 20 to about 35 % by weight of hardener component of a mixture of polyamides.

55. The infiltrant system of claim 1 wherein the hardener component comprises a combination of a polyamine and an aliphatic amine.

56. The infiltrant system of claim 55 wherein the hardener component is a combination of polyoxypropyleneamine and diethylene glycol di(aminopropyl) ether base unmodified aliphatic amine.

57. A method for infiltrating a part made by a rapid prototyping process comprising:

mixing an infiltrant system comprising a resin component and a hardener component,

the resin component comprising:

an epoxy resin; and

a diluent; and

a hardener component comprising:

an amine;

optionally an amide; and

optionally a catalyst;

providing the part;

applying the infiltrant system to the part;

curing the infiltrant system.